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THE OPTICAL CONSTRUCTION OF THE PHOTO-TELE-OBJECTIVE.[1]

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AT a late meeting of the Amateur Photographic Club, in Vienna, Professor Anton M. Haschek exhibited a camera supplied with one of Dr. Adolf Miethe's Photo-Tele-Objectives, giving a practical demonstration of the large image to be obtained with a minimum of camera extension.

On this occasion experiments were made by using a protractor as a model. The results demonstrated that at a distance of one meter, with six c.m. camera extension, the resultant image on the ground-glass equalled two-thirds the size of the subject.

With an ordinary lens, under similar conditions, the image measured but one centimeter.

At the next stated meeting Professor Haschek read a supplemental paper, in which he exemplified the optical construction of the new objective.

Professor Haschek stated that to be able to present a clear conception of its peculiar construction, it was necessary to refer cursorily to the primary principles of the lens-theory as laid down by Gauss.

We will take for this purpose the figure of a cross-section of a scalene bi-convex lens, showing the course of the parallel rays subsequent to their emergence from the lens.

[1]*Photographische Rundschau.*

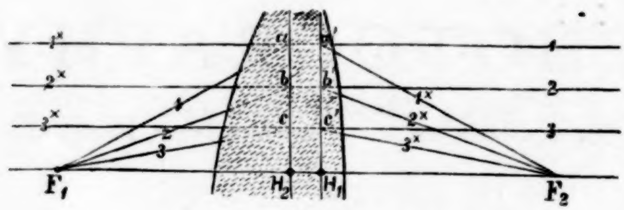

FIG. 1.

We perceive here parallel rays which fall upon the lens from both sides, in direction of their axis. If we follow these rays we find that those denominated 1, 2, 3, after their emergence from the lens are broken in their focal point towards F_1, while rays 1*, 2*, 3* diverge towards F_2.

If we now lengthen the entering and emerging rays up to their diameter, we will find that rays 1, 2, 3 at the points *a*, *b*, *c*, and the rays 1*, 2*, 3*, at the points *a'*, *b'*, *c'*, intersect, and which, as will be seen by the drawing (Fig. 1), both rest upon a plane that intersects the axis of the points H_1 and H_2—a problem which is also capable of being demonstrated mathematically.

If we now resolve the whole proceeding into a problem as represented upon a corporal lens placed perpendicularly upon a level plane, the parallel planes become the principal plane of the lens.

We are now enabled to picture the process of refraction in a convex lens. When a ray parallel to its axis reaches the principal plane of a lens turned towards it, the ray penetrates without diversion, and breaks only when it reaches the next line of the principal plane. A ray becomes reversed when directed from its course toward the nearest principal plane, and parallel to its axis it takes its course through the focal point, and leaves the second principal plane without a change of direction.

You will thus perceive that the action of a lens is fully determined by four points, viz.: The focal points F_1 and F_2, and the principal points H_1 and H_2.

We will now apply this illustration to show the picture construction with a convex and concave lens.

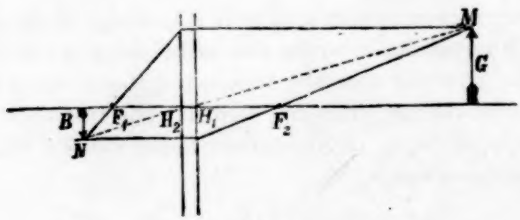

FIG. 2.

We will now take the four points, F_1, H_2, H_1, F_2, which will represent the cardinal points of a convex lens. The perpendicular lines H_1 and H_2 represent the principal planes; "G," an object. To obtain our image, we draw a ray parallel to its axis, so that it penetrates the principal plane at H_1, and is released at H_2, through the focal point F_1. The ray passing through the focal point at F_2, leaves the principal plane H_1 parallel to its axis, the intersection of both rays gives the position of the arrow-point in the picture. A perpendicular line drawn upon the axis designates the image B of the original.

When we connect the point M with H_1 and N with H_2, we find that the ray penetrating H emerges from H_2 in the same direction.

This property is utilized in the construction of a picture by aid of a concave lens.

Assuming once more an existence of the same conditions regarding the principal plane and focal points, the ray parallel to its axis intersects the principal plane H_1, and is refracted at H_2, as if it emerged from F_2. The ray darting towards H_1 leaves H_2 parallel in an equal direction.

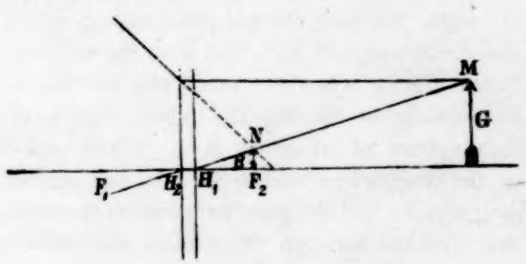

FIG. 3.

The intersection of both rays at N is an image of the point M; the line B perpendicular to the axis is the image of the object G. It will be observed that the intersecting point arises from the extension of the ray emerging from H_2, and that a virtual positive image results, in direct contrast to the convex lens, which gives a reversed image.

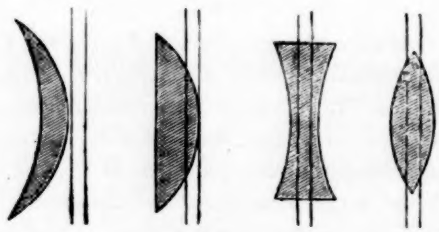

FIG. 4.

It is not requisite that the principal plane of a lens should fall within the body of the lens. By reference to above diagram it will be seen that the position of the principal plane varies with different lenses. Further, that in periscopic lenses the principal plane is actually outside of the lens.

Now, in relation to the new photo-tele-objective. The front combination consists of a convex lens, the back combination of a concave lens. It is requisite that the former combination should be of a greater focal length than the latter. If both lenses are adjusted so that the separation is less than the difference in their focal length, it forms a combination well known to you in the opera-glass. If, however, separated to a distance greater than their focal length, you have the tele-photo-objective.

You can easily judge of its action from the previous description of the lens theory, when you recall that the same conditions which are requisite in locating the principal plane in one lens answer for a system of refracting rays. When we follow a ray falling into the objective parallel to its axis, and intersect it with an emerging ray, we find the principal plane of the objective.

The ray refracted through the convex lens falls upon the

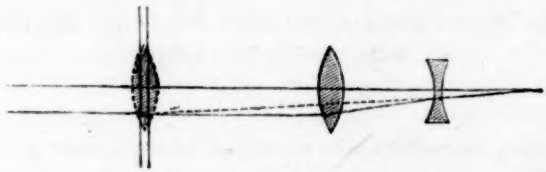

Fig. 5.

concave lens, and in consequence the intersection with its axis is forced to the rear. As may be seen by the diagram, the previously-mentioned intersection, together with the principal plane, is far in front of the objective.

As the distance of the focal point of the principal plane is at the same time the equivalent focal distance of the system, it proves that it is considerably greater than the vertical focal distance of the refracting plane from the local points, and therein consists the action of the combination.

If we substitute for the place of the principal plane a convex lens of the same opening, and of equal focal point and principal plane, the action will explain itself. The illumination and size of image will be equal to this substituted lens.

It is hardly necessary to mention that the new objective is achromatic, and gives a flat picture. The learned professor further stated why the new objective would fail to fill the great expectations claimed for it.

To make an exposure upon an object at a great distance requires not so much an instrument like the one under discussion, but mainly an absolutely clear atmosphere, free from dust. It is this condition which will greatly circumscribe the uses of the new objective in the field for which it was designed. However, there may be other uses for which the combination may be utelized where it will render excellent services, not strictly of a telescopic character.

But, under all circumstances, the combination is a material advancement in modern optics, and the photographic public is greatly indebted to the inventor. Julius F. Sachse.

DISRUPTION OF THE SILVER HALOID MOLECULE BY MECHANICAL FORCE.[1]

BY M. CAREY LEA.

IN a paper published about a year ago on the subject of allotropic silver, there was included an investigation into the action of the different forms of energy upon silver chloride and bromide. It was there shown that these substances possessed an equilibrium so singularly balanced as to be affected by the slightest action of any form of energy. Such action produced a change which, though it might be wholly invisible, yet caused the breaking up of the haloid when subsequently placed in contact with a reducing agent. The forms of energy with which this effect was observed are:

1st. Heat.
2d. Light.
3d. Mechanical force.
4th. Electricity (high tension spark.)
5th. Chemism.

It follows therefore that it is not light only that is capable of producing an invisible image, but that this power belongs alike to all forms of energy. So that a slight impulse from any one of the forces just mentioned brings about a change in the equilibrium of such a nature that the molecule is more easily broken up by a reducing agent.

As respects four out of these five forms of energy, it was further shown that when made to act more strongly, they were able of themselves to disrupt the molecule without external aid. One form alone of energy, mechanical force, made an apparent exception to this general rule. The other four, when applied to a moderate extent, produced a latent image: applied more strongly they broke up the molecule.

The first object of the present paper is to prove that this exception does not exist, and that as all forms of energy have been shown

[1] Read before the National Academy, April, 1892, by George F. Baker.

in the previous papers of this series, to be capable of impressing an invisible image, so also with stronger manifestations, any form of energy is capable of disrupting the molecule.

I was able to show many years ago that mechanical force could produce a latent image. Lines drawn with a glass rod on a sensitive surface could be rendered visible by development in the same way as impressions of light. An embossed card pressed on a sensitive film left an invisible image which could be brought out by a reducing agent. The raised portions of the embossed work exerted a stronger pressure on the sensitive film than the rest of the card, and these portions darkened when acted upon by a reducing agent. In the same way the lines traced with a glass rod blackened under a developer. In each case, it was the portions which had been subjected to pressure which yielded first to the reducer. It was therefore clear that in the molecule which had received this slight pressure the affinities of the atoms had been loosened.

To bring these phenomena fully into line with the others, it is now necessary to prove that an increased pressure can take the place of a reducing agent and disrupt the molecule. And this is actually the case.

It was found that the breaking up could be produced in two ways, by simple pressure, and by shearing stress. Silver chloride and bromide formed and washed in absence of active light were subjected to these agencies.

1. *Simple Pressure.*—In the first trial made with silver chloride, it was enclosed in asbestos paper which had been first ignited with a blast lamp to remove all traces of organic matter present. This method was tried in order that the chloride should be in contact with perfectly inactive material only, but it was not found to answer. The great pressure employed forced the dry chloride into the pores of the paper, cementing it together, so that the opposite sides could not be separated. Platinum foil was then substituted with satisfactory results. With a pressure of about one hundred thousand pounds to the square inch, maintained for twenty-four hours, the chloride was completely blackened except

at the edges, where, owing to greater thinness, the pressure was less. Very bright foil was used in order to detect the slightest discoloration that might occur, but none resulted; it was impossible to distinguish the portions which had been in contact with the darkened chloride from those that had not. The chloride did not assume the usual chocolate color, but changed to a deep greenish black. Silver bromide gave exactly the same results. It should be mentioned that the silver chloride and bromide were each precipitated with an excess of the corresponding acid.

As silver iodide precipitated with excess of potassum iodide is not darkened by light, it seemed improbable that it should be by pressure. The experiment was however tried, and it was found that the iodide darkened fully to the same extent as the others. This result surprised me so much that the experiment was repeated with every possible precaution. The result left no doubt that silver iodide, as well as the chloride and bromide, is blackened by great pressure. All three silver haloids take on the same coloration, an intense greenish black. It was found best to use the material air-dried. If at all moist, the platinum foil bursts under the pressure, and the experiment is invalidated. The air-dried salt retains sufficient quantity of moisture.

2. *Shearing Stress.*—As a means of applying this form of force, the silver chloride precipitated with excess of hydrochloric acid and well washed, was put into a porcelain mortar and well triturated. The improbability that the small quantity of force that can be applied in this way would break up a stable molecule like that of silver chloride seemed so great that at first a substance tending to aid the reaction was added. Tannin was selected, and when forcibly ground up with silver chloride the latter was soon darkened. Next a substance capable of taking up acid, but having no reducing action, was tried. Sodium carbonate was used. This also caused the chloride to darken. Finally it was determined to ascertain if the molecule of silver chloride could not be disrupted by stress alone. The chloride was placed in a chemically clean porcelain mortar and well triturated. For some time no effect was visible. After about ten minutes' action dark

streaks began to appear, and after five minutes' more work a considerable portion of the chloride was darkened. The end of the pestle was covered with a shining purple varnish. It had not become perceptibly warmer to the touch. On the violet purple substance nitric acid had no action, but aqua regia slowly whitened it. It was therefore what I have proposed to call silver photo-chloride, that is, a molecule combination of chloride and hemichloride. This experiment was carefully repeated with the same result. Silver bromide similarly treated gave a similar result. It was noticed that both chloride and bromide in darkening took on the familiar color between chocolate and purple, so generally seen in the darkening of these silver salts, and differing strikingly from the greenish black color assumed by all three silver haloids under simple pressure.

The fact that the platinum foil remained absolutely unattached when the silver haloid was reduced by simple pressure in actual contact with it, is interesting, and would seem to show that in the reduction of the silver haloid the halogen is not at any time set free, but that water, if present, is decomposed at the same moment with formation of halogen acid.

The observations recorded in this paper prove the existence of perfect uniformity in the action of all kinds of energy on the silver haloids. The balance of the molecule is at once affected by the influence of any form of energy. A slight application produces an effect which, though invisible to the eye, is instantly made evident by the application of a reducing agent. The bonds which unite the atoms have evidently been in some way loosened so that these molecule break up more easily than those to which energy has not been applied. Consequently, if the substance is submitted to the action of light, heat, or electricity, or if lines are drawn by a glass rod (shearing stress), or with sulphuric acid, chemism, a reducing agent, blackens the parts so treated before it affects the parts not so treated. This justifies the statement made earlier in this paper that the phenomena of the latent image and of its development are not exclusively, or even especially,

connected with light, as heretofore supposed, but belong to all other forms of energy as well.

It is therefore true that every form of energy is not only capable of producing an invisible image,—that is, of loosening the bonds which unite the atoms, but is also capable, if applied more strongly, of totally disrupting the molecule. This law, in a general form, was proved in other papers, with but a single exception, and that one exception is removed by the observations recorded in this paper.

As far as observations have gone silver compounds are the only ones that exhibit this universal sensitiveness. Of other substances, some are decomposed by heat, some by electricity or by chemical action, and a few by light.

It has been shown, as I believe for the first time, that mechanical force is competent without the aid of heat to break up a molecule that owes its existence to an exothermic re-action.

It is important to distinguish between the two treatments here described. In the case of shearing stress, force is expended in overcoming friction, and in so doing produces heat. It may be questioned, however, whether the very small amount of heat thus generated has anything to do with the re-action. The heat is not perceptible—it is momentary, and it has been elsewhere shown that though moist silver chloride can be broken up by heat, the action is slow even at a temperature of 100° C.

In the case of simple pressure heat certainly plays no part. The material is small in quantity, is folded up in metal, is placed between large and heavy pieces of metal, and the pressure is applied gradually by means of a screw. Even supposing a slight increase of temperature, it could not exceed one or two degrees, and would be momentary. As just remarked, heat does not produce an effect except at about 100° C. and after many hours.

The powerful affinity which exists between silver and the halogens is well known. That this affinity can be counteracted and annulled by simple pressure, that the halogen can in part be forced out of the molecule by mechanical means unaided by heat, is remarkable.

It need scarcely be said that this phenomenon has nothing in common with decompositions produced by mechanical force in substances such as silver or mercury fulminate, nitrogen chloride and similar explosives. Such substances are all formed by endothermic re-actions, and their decompositions are exothermic.

Heat does not need to be supplied, but only what Berthelot has named a "travial préliminaire,"—an impulse to start the re-action.[2]

But silver haloids are formed by exothermic re-action, consequently their decompositions are endothermic, and require that the energy which was disengaged in their formation should be returned to effect their decomposition. The experiments described in this paper show that mechanical force may be made to supply this energy, and so play the part of light, electricity or heat without previous conversion into any other form of energy.

The thermo chemical re-actions of the silver haloids have been studied by Berthelot, and their reductions were found to be endothermic. There can be no doubt therefore that an endothermic re-action can be brought about by simple pressure.

New Field for Models.—The most curious occupation heard of lately, is that of a young woman who earns bread and butter by being photographed. It has been a business, occupying a small number of women in Paris regularly, for some years back, to pose for sketch artists or before the camera for the composition of the fashion plates sent out with the more expensive French fashion magazines. Nothing of the sort has been done in New York until lately, when a demand sprang up for fashion plates which looked life-like and not wooden, and the utmost difficulty has been experienced in getting a better class of art work in them. Women with pretty faces are beginning to be appealed to to lend their features and their figures for the purpose.

[2] Mecanique chimique, vol. 2, p. 411. The reduction of silver chloride to metal involves an absorption of Cal. 29.4. That to hemichloride has not been measured, but is, according to Berthelot, also endothermic. See also, Ditte, Les Metaux, 1, pp. 232, 233.

A PLEA FOR THE HAND CAMERA.

XANTHUS SMITH.

HAVING noticed in some articles published lately by writers about cameras and photographing, a disposition to speak disparagingly of hand cameras, as detective cameras are now often called, and of hand camera work, we would feel disposed to say a word or two in their favor.

The idea which these writers would seem to wish to convey is, that any work which is done in photography other than with a camera well secured upon a tripod is mere trifling, and altogether beneath the attention of the would-be artistic photographer,—who, they would lead you to suppose, is invariably to give so much concern to the selection of his subject, and the focusing and exposure, that any apparatus which does not admit of being screwed to a table-like support must be considered entirely inadequate to the production of valuable photographic pictures. The going about with a trifling little box, though it may appear formidable in its complexity of screws and registers, dials and triggers, and snapping away at whatever presents itself to you as curious, it is mooted by some, is employment suited only to the half-witted enthusiast or the school boy, and should be frowned down by the legitimate photographer, who sets his art above such light accomplishments as sporting with a hand camera.

Now let us look at this subject of hand camera work from a different point of view, perhaps more impartially, and with a more progressive state of mind, and see whether the hand camera does not deserve a better standing alongside of its old tripod parent,—whether it must necessarily hang its head as an impostor in the presence of the good old legitimist who is useless without his three legs, and whether the man—or woman either—who sports the hand camera must take a back seat amongst the profession.

First, let us remark that we approve of the incoming term *hand camera*, because in its progression and perfection this sort of camera is in many instances developing out of the purely

detective instrument, which it was held within the confines of in its earlier forms. The departure from the concealment of its purpose, by enabling the use of a lens better adapted for making agreeable pictures, for instance, we consider a great stroke in its favor.

We have now to look at a number of considerations which must be taken into account in fixing the degree of importance which should be given to hand camera work.

The improvement, as we have said, of opening the front of the hand camera, and introducing a long bellows which may be racked out, thus admitting of the use of a long focus lens, completely does away with the great objection to which the first detective cameras were open, of extreme wideness of angle of the objective and consequent distortion. Now the individual who handles the hand camera may eschew such subjects as are not at a sufficient distance to form agreeable pictures, and confine himself, should he be so inclined, to purely artistic effects.

Then the superior lens, with the extremely rapid plates now at our command, give us together an amount of detail in instantaneous exposures which does away with the old objection of under-exposure in shutter work. Indeed, we have been astonished lately with views taken with hand cameras provided only with single lenses. So fully was the detail brought out in the shadows, and so ample was the work in half-tones, that nothing more could be desired, and we can safely say that had the camera been secured upon a tripod and a time exposure given, the resulting pictures would not have been better. Of course the subjects were open landscape and water scenes.

We would not be understood as advocating the use of the hand camera for professional work, which must generally be upon a much larger scale than that of most amateurs, nor for any of the legitimate uses of the ordinary camera mounted upon a tripod, but one of the most extensive branches of photography now, and one that is daily on the increase, is that of the tourist, and what a zest has it not given to the enjoyment of hundreds of individuals who go upon their summer or winter excursions as

the case may be, to be able to secure momentos of whatever may appear beautiful or interesting to them for future reference, and to convey at a glance to their friends what the most prolonged description could not have made intelligible.

Many years ago, in the old wet-plate days, and when amateur photographers were about as scarce as dry plates were in those days, the writer was making a painted study from nature in a glen renowned for its scenic attractions. He was come upon suddenly by a most venerable-looking clergyman, accompanied by a party of ladies. Pausing as he passed, the man of good work said to the painter, "Ah, you are the fortunate man, for you not only enjoy all the beauties here set before us, but you carry them away with you." Now who may not carry away with them the beauties which they encounter upon such occasions? Think of the capabilities of the little box, but a few inches square, hung over the shoulder by straps. What youth or delicate lady or old man could feel incumbered by it? And in it they may carry away,—we had almost said hundreds,—but truly dozens upon dozens of charming views, quaint groups, or grotesque subjects for future intellectual enjoyment.

It must be remembered that if a great many persons who are lacking either in good taste or in some art culture, and who use detective or hand cameras, take innumerable inartistic and indeed often very absurd pictures, it is not the means that is to be blamed, but the individual instead. With a fair amount of training in the proper direction, and good judgment, we will venture to say that far more may be done with a hand camera in the way of securing excellent pictures than with the most elaborate pains bestowed with set-up camera where good taste is wanting. We have only to bear in mind that there are certain limitations to all photographic work, certain boundaries, which, if we go beyond, we will be violating good taste and good judgment, and that a hand camera even does not license us to go beyond these.

One circumstance greatly in the favor of the use of a hand camera is that it may be used on the instant. How often does it not happen that we have presented to us for a few moments

some rare combination in the way of grouping or effect, especially in subjects comprising figures and animals, which if we could secure them within a minute or so we might have the pleasure of adding to our albums, whereas if we must needs unpack and set up, we can only say at the outset that the attempt is useless, and again, we are led to attempt exposures which we would not make under other conditions, and thereby may secure such combinations and effects as give the greatest variety and zest to our collections.

It must be admitted, though, in connection with hand camera work, that in order to attain satisfactory results a considerable amount of previous practice with the camera or tripod would be of advantage in improving the judgment in selection of view and lighting, because the operator must determine sometimes on the instant what will make a satisfactory picture and what will not, and a few points should always be kept uppermost in the mind. There should not be too great a prevalence of shadow in the subject. In the case of landscape or street scenes, if attempted on bright sunny days with a clear sky, if we look too much toward the sun it will be almost impossible to prevent an overwhelming amount of strong shadow unrelieved by detail, which will be rendered still less agreeable by the narrow, harsh cutting lights.

A very important point in hand camera work is that we see that we are not carried away by our subject. That is,—always remember that the beckground and surroundings of that which strikes you as highly suited to your fancy, will be just as prominent, nay frequently ten times more so, in the photograph as that for which you are aiming, and will ten to one so overwhelm what you sought as to render it worthless. A very large percentage of the work which we see done with hand cameras is ruined by the prevalence of busy spots of light and dark in incidental objects which are entirely irrelevant to the subject of the picture, and when it is seen beforehand that such will be the case, the exposure had better not be made.

Of course in many instances it is very difficult, in fact, often impossible, to tell just what will be the very nick of time to make

the exposure, and here the element of luck comes in. It does not do to be too cautious, or you may continually be losing the best chance in hesitating for a better one, and, on the other hand, if you are too ready about your exposures your plates or films will have been expended before the best is arrived at. Of course individual circumstances will govern a good deal in this matter. With those persons who are so fortunate as to possess both ample time and means, we would say fire away,—do not miss a chance that would seem likely to result in an interesting picture, and subsequently destroy those negatives which are undesirable. The less favored will have to be more wary, and rather take the risk of losing a picture than waste their material.

In conclusion, let us advise all who may to secure a good hand camera, one of the improved sort with ample lens capacity, and we will ensure that if they limit their work within the bounds of good taste, in the selection of subjects, they will derive much gratification from the pursuit, and will surely accord the hand camera the place which it deserves as a very important auxiliary to the photographic art.

The Purity of Platinic Chloride.—In Krauch's work on the testing of reagents for their purity, the only requirements prescribed for platinic chloride are that it should be completely soluable in absolute alcohol, and that when ignited the residue should yield nothing soluble to dilute nitric acid. A. F. Holleman now reports (in *Chem. Zeitung*, 1892, No. 3) that he has met with a platinic chloride, obtained from one of the best-reputed manufacturers, which responded to the above tests, but was found, when used for the quantitative determination of potassium, to yield such discrepant results that some other impurity was suspected to be present. On close investigation it was found to contain sulphuric acid.

To Photograph the President.—C. M. Gilbert, the photographer, has been asked to photograph President Harrison at the White House.

EARLY DAGUERREOTYPE DAYS.—III.

AN HISTORICAL RETROSPECT.

BY JULIUS F. SACHSE.

(*Continued from page 315.*)

THE APPLICATION OF BROMINE.

THE successful demonstration of Daguerre's process by Joseph Saxton, together with the subsequent experiments by Robert Cornelius, excited a widespread interest in the scientific circles of Philadelphia. Among the scientists who thus became interested in the new process was Dr. Paul Beck Goddard, assistant to the professor of chemistry in the University of Pennsylvania, who then resided, or had an office on the east side of Ninth Street, opposite the University.

Dr. Goddard at once opened communication with Mr. Cornelius, examining the apparatus, and investigating carefully the manipulations as practiced thus far by the latter. These visits ended by a duplicate apparatus being made for the use of Dr. Goddard, who entered into a series of chemical experiments, in which it is stated that he had the assistance of the celebrated chemist, Professor Robert Hare.

It will be noted that thus far all the results shown by Saxton and Cornelius had been obtained by the use of dry iodine as a coating for the plates.

In the previous chapter it has been stated that the first two portraits ever made by the daguerreotype process, were made by Cornelius,—the first of himself, the other of his children, which is also still in existence. The honor of making the third portrait belongs to Dr. Goddard. This was also made in the open air in the rear of his residence on Ninth Street, by the use of dry iodine. The subject or sitter was a student in the medical department of the University,—Aaron D. Chaloner. An interesting account of this sitting was given the writer by an old physician still living, who was present on this occasion, fifty-three years ago, while a student at the University of Pennsylvania.

The subject, Chaloner, was seated upon a chair in the bright sunlight, with the injunction not to move, but he became restless before even the preliminary operations, such as focussing, were completed. Dr. Goddard, fearing that the attempt might result in failure, obtained from Dr. Hare's laboratory in the University opposite, a blue reflector of some kind, and after the focusing was completed, a blue reflection was thrown upon Chaloner by an assistant, in such a manner as to neutralize the direct rays of the sun. The exposure, it is stated, was prolonged to about three minutes, and resulted in a fair picture.

The investigations and chemical experiments of Dr. Goddard were mainly confined to chlorine, bromine, and iodine, and he was not long in discovering that bromine combined with iodine on the plate would reduce the time of exposure from one-third to one-half within doors* while in his yard, in the open air, the impression was almost instantaneous. These experiments resulted in the production of a perfect specimen by the use of bromine, in December 1839, which was subsequently shown at the American Philosophical Society (Proc., Vol. III., p. 180).

This is the first record of the employment of bromine in the photographic process. It was during this series of experiments with bromine that Dr. Goddard succeeded in obtaining several good views and portraits instantaneously in the open air, which were the *first instantaneous pictures made by any heliographic process in the world.*

The application and use of bromine as an accelerator was kept a close secret by Goddard and Cornelius, for about two years. It was this use of bromine, together with Cornelius' superior skill in polishing his plates, which account for the great beauty of his early daguerreotype miniatures. There is still in existence a plate,[1] unfortunately in a very dilapidated condition, which it is claimed was one of Goddard's earliest bromide efforts. It represents two male figures in a negligé attitude, one leaning back in a chair, the other against a fence. The picture was without a doubt made in the open air.

* The laboratory of Dr. Goddard was lighted by a skylight.

[1] Now in possession of the writer.

It has been stated to the writer by several old persons who knew Dr. Goddard well at that time, that for a short time he also made for pay daguerreotype miniatures at his residence in Ninth Street. His appointment as demonstrator of anatomy in the University of Pennsylvania in the year 1841, diverted his attention from professional portraiture. He, however, did not relax his interest in the new art.

In the latter part of the year 1841 a young man, an assistant to Cornelius, was approached and tampered with by parties from New York, who had opened a daguerreotype gallery there. This individual succumbed to the temptation of the offers made to him, and secretly left Cornelius and worked for two weeks in New York, divulging the whole secret of the use of bromine as an accelerator. As soon as this fact became known, Dr. Goddard at once published the discovery, and the process became public property, and soon came into general use. At a subsequent stated meeting of the American Philosophical Society, held January 21, 1842, Dr. Goddard presented specimens of photographic portraits made by the diffused light of a room, and by the peculiar process in which bibromide of ioidine is used. This process he described, and stated that he had ascertained only on that day, that a similar method had been presented to the French Academy, which, however, in some particulars, was inferior to his own. (Proc. Am. Philo. Soc., Vol. II., 144.) On the fourth of March following Dr. Goddard exhibited, before the same society, specimens of daguerreotypes on a surface of gilded silver, and stated that the surface of iodide of gold was more susceptible to the daguerreotype action of light than that of the iodide of silver, that the surface of the plate might be polished without injury before the action of the iodine, and that the lights came out better than on the silver surface. (Proc. A. P. S., Vol. II., p. 150).

In English and Continental text books upon photography, the claim for priority in the use of bromine as an accelerating agent is usually accorded to one John Goddard, a London optician. That this is clearly an error is apparent from the above indisputable record. The honor for the first use of bromine as a sure and valuable accelerator, and the subsequent application to daguerreotype

and photography, without a shadow of a doubt belongs to Dr. Paul Beck Goddard, of Philadelphia.

Dr. Paul Beck Goddard, from photograph by F. Gutekunst, Philadelphia.

Paul Beck Goddard, a native of Philadelphia, was born in the year 1809, graduated in the medical department of the University of Pennsylvania in 1832, appointed demonstrator of Anatomy for the same institution in 1841, a position which he resigned in 1847, when called to the chair of Anatomy of Franklin Medical College, which he filled until 1852. In 1847 he was appointed Surgeon to the First City Troop—Philadelphia's crack military organization. From 1859 to '63, Dr. Goddard was connected with the Philadelphia Board of Health, from 1863 to 1865 he served as Surgeon in the U. S. Volunteer Service. He died July 5th, 1866.

It is further a a noteworthy fact that while Philadelphia scientists labored to shorten the time of exposure by chemical means, confining themselves exclusively to the daguerrean apparatus, which time has proven to be the only practical method, experimenters in New York attempted to achieve the same object by the use of mechanical inventions and such chimerical apparatus as a reflecting camera and other equally impracticable devices, which were all abandoned as soon as Goddard's Philadelphia process had been surreptitiously obtained.

The First Snapshot.

Among early experimenters in heliography whose names should not be forgotten, is that of Dr. Joseph E. Parker, who lived number 61 North 7th Street, then a fashionable quarter of the city. Dr. Parker was a dentist by profession, an active mem-

ber of the Franklin Institute, and one of the first experimenters to use the Daguerre process for out-door views, street scenes, etc. He was also one of the pioneers in micro-photography. It is more than probable that Dr. Parker was let into the secret of the use of bromine at an early day, as it would have been impossible to obtain the instantaneous views by the use of dry iodine.

A heliograph (daguerreotype) upon a silvered plate 6x5 inches made by Dr. Parker in the month of March, 1840, is now in possession of the Historical Society of Pennsylvania. It represents Race street wharf at the Delaware, and after the lapse of more than half a century, is still (except where mechanically injured) in a perfect condition, and in definition equal to many of the amateur efforts of the present day.

A series of these views by Dr. Parker were exhibited in the "Department of Fine Arts" at the Franklin Institution exhibition held during October, 1840. These specimens naturally attracted much attention, and were greatly admired for their beauty and fidelity to nature. The only question which arose to their detriment was the as yet unknown factor of permanency. The committee on premiums awarded Dr. Parker a *certificate* of *honorable mention* for his exhibit.

How long Dr. Parker remained a disciple of the daguerrean art the writer has been unable to determine, nor does there seem to be any record of any specimens from him at any subsequent exhibitions.

ARTIFICIAL LIGHT.

The first picture ever taken by artificial light, of which there exists any definite record, was made towards the end of the year 1839, by William G. Mason, a resident of Philadelphia. Mason, was a well known engraver, whose establishment for many years was located at No. 46 Chestnut street (now 204), above Second street. At an early date he became interested in the Daguerre process, and being proficient in polishing silver plate, soon obtained some fine specimens of heliography. It was while pursuing these experiments with his crude apparatus and hap-hazard chemicals, that he succeeded in making a perfect copy of an

engraving, by artificial light, the source of illumination being a small gas burner, and the time of exposure about one hour. This was probably the first heliograph ever taken without the aid of direct sunlight.

Some of these efforts of Mason's were still in existence during the Centennial year (1876), and it was always the opinion of old daguerreotypists that Mason's success depended entirely upon his skill in obtaining an exceedingly high polish upon the silver plates which he used in his experiments. The writer has been unable to discover the whereabouts of any of these specimens at the present day.

Among the earliest pioners in the photographic field there is one whose name must not be forgotten, viz.; Edward Tilghman, Esq., who, for over half a century, has continuously kept an interest in photography in all of its various phases, from Daguerre's crude process to Ives composite heliochromy of the present day. This veteran amateur, a member of the *Photographic Society* of *Philadelphia*, was in Europe when the first notice of the process was published; returning shortly afterwards to his native country, he at once obtained an outfit and took up heliography. For plates he rolled out silver quarter and half-dollar coins; these were then polished, coated, and exposed in the camera and used for portraiture. A specimen portrait made by Mr. Tilghman about 1840 is at present in posession of the writer.

Mr. Tilghman was probably the first amateur photographer who made portraiture a study.

Attempts at Portraiture Elsewhere.

Before passing the subject of early experimental portraiture, it will be well to leave Philadelphia for a short time and take a survey of the photographic field at large;—at home as well as abroad.

It must be borne in mind that at the period of Daguerre's discovery, there were, as yet, none of the present rapid modes of inter-communication,—no telegraph, telephone, nor ocean cables,

([2] Vide History of Heliographic Art, pp. 355.)

to flash the news of a new discovery around the globe in seconds of time.

The Associated Press, with its army of correspondents and interviewing reporters were, as yet, uuknown, while a daily mail service, with ocean Greyhounds, was undreamed of. All intercourse was by private correspondence and depended upon the primative mail service afforded by the stage coach and ocean packet. Thus it was that results achieved at distant places were weeks and months in becoming generally known.

Although the problem of heliographic portraiture had been practically solved in Philadelphia within two months after publication of the process in America, it is not to be supposed that no efforts were made elsewhere to utilize the Daguerrean process for portraiture, notwithstanding the fact that Daguerre personally had but little hope for the application of his process to portraiture from life, on account of the length of time requisite for the exposure.

In America the names of Professor J. W. Draper and Samuel F. B. Morse, of New York, are prominently associated with the subject of early portraiture. Friends of both having repeatedly claimed that to their particular champion belongs the honor of having been the first to apply Daguerre's process to portraiture.

Prof. Draper had occupied himself with investigating the chemical effects of light, almost ten years before any one in America had turned attention to the subject. The deductions were published in the *Journal* of the *Franklin Institute*, several years prior to the publication of Daguerre's process. Shortly after the latter was published in America, Professor Draper had constructed an apparatus, according to directions, with a common spectacle glass, of fourteen inches focus, arranged at the end of a Segar box, as a camera.[1] This lens was found to answer for plates 3x4 inches. With this crude apparatus Prof. Draper made numerous attempts at heliographic experiments.

After numerous failures and disappointments,[2] he succeeded in obtaining several views of buildings, and other objects, from

[1] London, Edinburg, and Dublin Philosophical Magazine, Vol. XVII., p 220.

[2] Root, p. 341.

his laboratory windows, which were somewhat similar to Saxton's earliest efforts.

It was sometime during the next year (1840) that Prof. Draper attempted the application to portraiture. For this purpose he had constructed a camera with a lense five inches in diameter and seven inches focus. When all preparations were completed, the victim, after having his face well powdered over with flour to make it look like a plaster cast, was placed in the bright sunlight, the back of the camera was pushed back to the violet focus, after which the sitter was subjected to the torture of a fifteen minute exposure.[3] The result was an impression which showed such parts as the forehead,[4] cheeks, and chin, upon which the light fell most favorably. Another attempt, in which the time was greatly prolonged, produced an outline of the whole conntenance. Upon this experiment seems to be based Dr. Draper's clai.n for priority in photographic portraiture. Diligent inquiry has failed to locate any of Draper's early specimens, or settle the date of this experiment with any degree of certainty, but there is no doubt that it was made at least three months after Cornelius' portrait was shown at the meeting of the Philosophical Society in Philadelphia.

Crude as was this attempt at heliographic portraiture, it was thought of enough importance to herald abroad as an application of Daguerre's process to portraiture.[5]

Prof. Morse, the inventor of the Magnetic Telegraph, was also a pioneer in daguerreotypy. When Daguerre first announced his discovery, in 1838, Morse was in Paris, for the purpose of showing his Electro-Magnetic Telegraph. Daguerre then kept his process a close secret; even the results were carefully guarded, and then had been shown only to the King and a few distinguished Savans. By advice of M. Arago, Daguerre refused to show them to other persons during the pendent action of the French Chambers.

(*To be Continued.*)

[3] Schiedel Geschichte, p 43, W. Jerome Harrison states half an hour, p. 26.

[4] Root, p. 341.

[5] London *Journal of Science* June, 1840.

ELEMENTARY THEORY OF THE EQUIVALENT FOCUS II.

BY PROF. HENRY CREW, LICK OBSERVATORY.

Refraction through Lenses.

Being now in a shape to treat spherical surfaces in general, let us consider the image I′ (fig. 3) as an *object*, producing a second image by refraction through a second spherical surface. We shall then have the case of the single lens.

Following Seidel's notation, R_4 will be the radius of this second surface.

The case in which the refractive index of the *third* medium is the same as that of the *first* will include nearly every case met with in practical photography.* We shall, therefore, call the refractive indices of these two media, unity.

In fig. 4, let S_2 and S_4 be two refracting surfaces whose optical axes coincide: f_4 and f'_4 the first and second principal foci of the second refracting surface; a'' and b'' the images of a' and b' after refraction at S_4: the other symbols have the same meaning as before; since the optical axes of the two *surfaces* coincide, the line aa' will be the optical axis of the *system*.

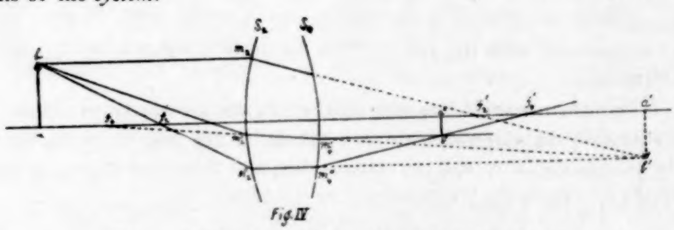

Fig. 4. Illustrating refraction at two spherical surfaces.

The manner in which the object ab gives rise to the image $a'b'$ we have just seen.

Consider now $a'b'$ as the luminous object.

The ray m''_2b', being parallel to the optical axis, will after refraction at S_4 pass through f'_4. Join b' and f_4. The intersection of this line with the surfaces S_2 and S_4 will determine the points m'_2 and m'_4. This ray ($m'_2m'_4$) will, of course, coincide with the ray bm'_2 after refraction

*The human eye furnishes a case in which the first and third media are quite different.

at S_2, and will after refraction at S_4 be parallel to the optical axis. The point of its intersection with $m''_4 f'_4$ will be b'', the image of b'. In like manner, each point on the line $a'b'$ will have its conjugate point on the line $a''b''$.

The line $a''b''$ is therefore the image of ab produced by the lens.

Geometrical Determination of the Focus.—The second focus of the lens will be the point where a ray, leaving the object, parallel to the optical axis, intersects the optical axis after two refractions.

To find this point, we have in fig. 5 only to join m_4 with b''.

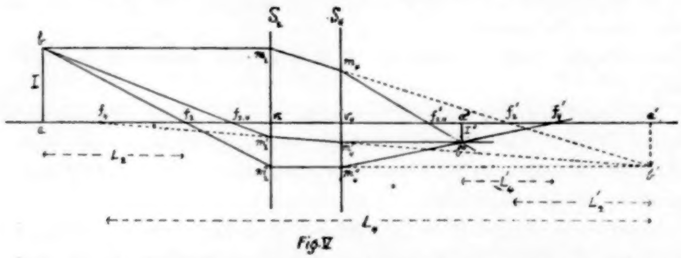

FIG. 5. Illustrating the geometrical determination of the principal foci of a lens.

Its point of intersection with the axis, $f_{2,4}$, will be the *second* principal focus of the lens.

To determine the first principal focus, join b with m'_2. This ray emerges, after two refractions, parallel to the optical axis. The point of intersection with the axis, $f_{2,4}$, is therefore the *first* principal focus of the lens.

If our geometrical ideas are now clear, we are ready to derive a practical formula in which we may substitute the numerical values of the radii of curvature and refractive index, and thus *compute* the position of the foci from the "constants" of the lens.

For the surface S_2, we have by Eq. 14,

$$L_2 L'_2 = F_2 F'_2$$

For the surface S_4, we have

$$L_4 L'_4 = F_4 F'_4$$

where

$$\begin{cases} L_2 = -af_2 \\ L'_2 = +a'f'_2 \\ L_4 = +a'f_4 \\ L'_4 = -a''f'_4 \end{cases}$$

since (Eq. 11),

$$F'_2 = -\mu F_2$$
$$F_4 = -\mu F'_4$$

it follows that

$$F'_2 F'_4 = F_2 F_4 \quad \ldots\ldots\ldots\ldots\ldots \quad \text{Eq. 16.}$$

Definition of D.—Let us call D the distance *from* f'_2 *to* f_4; positive, of course, when measured to the right; negative when measured to the left, as in the figure.

Then

$$D = L'_2 - L_4 = \frac{F_2 F'_2}{L_2} - \frac{F_4 F'_4}{L'_4} \quad \ldots\ldots \quad \text{Eq. 17.}$$

Since L_2 and L'_4 determine conjugate points of the system, we have only to make these two distances respectively equal to infinity to determine the positions of the second and first principal foci of the lens,

When

$$L_2 = -\infty$$

$$\text{We have } [L'_4 =] \quad - \frac{F_4 F'_4}{D} = F'_{2,4} \text{ (say) Eq. 18.}$$

When

$$L'_4 = \infty$$

$$\text{We have } [L_2 =] \quad \frac{F_2 F'_2}{D} = F_{2,4} \text{ (say)} \ldots \text{E. 19.}$$

Since these quantities $F_{2,4}$ and $F'_{2,4}$ are special values of L_2 and L'_4, they obey the same rule of signs and are measured from the same origins, viz., f_2 and f'_4.

As will be seen, these focal distances are numerically equal only when the radii of curvature of the two surfaces are equal.

Employing Eqs. 18 and 19, we may write Eq. 17 in the following form:

$$\frac{F_{2,4}}{L_2} + \frac{F'_{2,4}}{L'_4} = 1 \quad \ldots\ldots\ldots\ldots \quad \text{Eq. 20}$$

Let us still further simplify Eq. 20 by calling the distance of the object from the first principal focus, $K_{2,4}$: and the distance of the image from the second principal focus, $K'_{2,4}$.

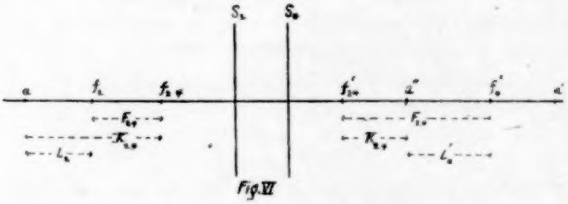

FIG 6.—Illustrating Newton's Rule for lenses.

Then (Fig. 6)

$$K_{2,4} = L_{2,4} - F_{2,4}$$

and

$$K'_{2,4} = L'_{2,4} - F'_{2,4}$$

Eq. 20 now assumes the form

$$\frac{F_{2,4}}{K_{2,4} + F_{2,4}} + \frac{F'_{2,4}}{K'_{2,4} + F'_{2,4}}$$

or

$$K_{2,4}\, K'_{2,4} = F_{2,4}\, F'_{2,4} = -\frac{F_2\, F'_2\, F_4\, F'_4}{D^2} \quad . \; . \; . \text{ Eq. 21.}$$

This is the most elegant form in which one can express the relation between the positions of conjugate points, and shows that "Newton's Rule" applies to lenses as well as to single surfaces.

Dimensions of the Image produced by a Lens.—Having found the *position* of the image we now proceed to determine its *size*.

From similar triangles in fig. 5, it will be seen at once that

$$\frac{I}{K_{2,4}} = \frac{v_2\, m'_2}{v_2 f_{0,4}} = \frac{v_2\, m'_2}{F_2 + F_{2,4}}$$

$$\frac{-I''}{F_4} = \frac{v_2\, m'_2}{v_2\, f_2} = \frac{v_2\, m'_2}{D + F'_2}$$

Eliminating $v_2\, m'_2$, we have

$$\frac{I''}{I} = -\frac{F_4\,(F_2 + F_{2,4})}{K_{2,4}(D + F'_2)}$$

$$= -\frac{F_4\, F_2\left(1 + \frac{F'_2}{D}\right)}{K_{2,4}\,(D + F'_2)}$$

$$\frac{I''}{I} = -\frac{F_4\, F_2}{K_{2,4}\, D} = +\frac{K'_{2,4}\, D}{F'_2\, F'_4} \quad . \; . \; . \; . \; . \text{ Eq. 22.}$$

$$I'' = K'_{2,4} \times \textit{Constant} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \text{ Eq. 23.}$$

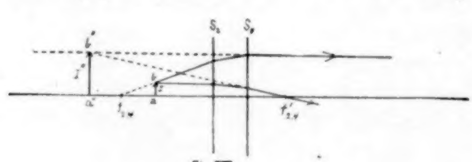

FIG. 7.—Showing how the size of the image depends upon the position of the object.

Definition of Principal Planes.—Considering still the same lens which we have been discussing, imagine the object *a b* to approach along the optical axis from an infinite distance to the left, *i. e.*, imagine $K_{2,4}$ to increase from $-\infty$ to o. It is evident from Eq. 21 that $K'_{2,4}$ will at the same time increase from o to $+\infty$.

As *a* passes $f_{2,4}$ (the case represented in fig. 7), $K_{2,4}$ changes sign: so, therefore, also does $K'_{2,4}$, since the right hand member of Eq. 21 is a constant, for any given lens.

From Eq. 22 it will be seen that when

$$K'_{2,4} = \infty$$

the image is infinite in size, and that, as $K'_{2,4}$ passes through infinity, the sign of the image is changed. If before it was erect, it is now inverted: if before inverted, as in the ordinary double convex lens, it is now erect. The image, it will be observed, always lies in the angle $b'' f'_{2,4} a''$. This is equally true whether the lens be a convergent or divergent one.

Let the object *a b* proceed still further to the right. The erect image will approach the object in size. Finally a point will be reached where the image has the *same size* as the object and is *erect.*

The plane now occupied by the object is known as the *first principal plane;* the plane occupied by the image is the *second principal plane.*

The *principal planes* of a lens may, therefore, be defined as the two planes which, if an object be placed in one of them, there will be formed in the other an *erect* image of the *same size* as the object.

These must be carefully distinguished from the two *symmetric planes,* an object placed in one of which gives rise to an *inverted* image of the *same size* in the other.

The points in which the principal planes intersect the optical axis are known as the *principal points* of the lens.

These, together with the *principal foci,* constitute the four *cardinal* points, or, as they they are sometimes called, after the man who discovered their properties, *Gaussian* points of the lens.

It is difficult to overestimate the value of Gauss's method of treating lenses. As will be seen in the sequel, it secures for the combinations actually used in practice all the simplicity and accuracy which belong to the hypothetical infinitely thin lens of the text-books.

Positions of Principal Planes.—To determine the positions of these planes, we have

$$\frac{I''}{I} = +1 \quad \ldots\ldots\ldots\ldots\ldots \text{Eq. 24.}$$

which gives us (Eq. 22)

$$[K_{2,4} =] \; - \frac{F_2 F_4}{D} \; = \; -F \text{ (say)} \quad \ldots \ldots \text{Eq. } 25.$$

$$[K'_{2,4} =] \; + \frac{F'_2 F'_4}{D} \; = \; -F' \text{ (say)} \quad \ldots \ldots \text{Eq. } 26.$$

But $K_{2,4}$ and $K'_{2,4}$ are the respective distances of the object and image from the first and second principal foci; so that F and F′ are the respective distances of the first and second principal foci from the first and second principal points. Since, Eq. 16,

$$F_2 F_4 = F'_2 F'_4,$$

it will be seen that

$$F = -F'.$$

The *first* principal *plane* is, therefore, at the same distance from the *first* principal *focus* at which the *second* principal *plane* is from the *second* principal *focus*.

The distance from either principal plane to its corresponding principal focus is what is known in photography as the "*equivalent focus*" of the lens; this same quantity is called in physics "*the true focal length.*"

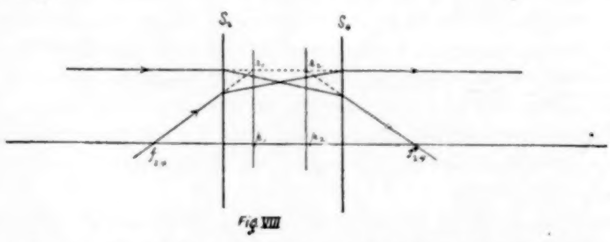

FIG. 8.—Showing the principal planes as planes of unit magnification.

It is quite evident geometrically, from Fig. 8, that if r be a radiant point, satisfying the condition expressed in Eq. 21, and giving rise to the two rays, $b\ r$, parallel to the optical axis, and $f_{2,4}\ r$, through the first principal focus, that these rays, after refraction, will intersect at the point r_2. So that the image of the line r, p, is, as we have proven above analytically, $r_2 p_2$, an erect image of the same dimensions.

As will be seen later, these planes for double convex lenses lie between the two bounding surfaces S_2 and S_4. In many of the most interesting lenses used in photography and astronomy they lie quite outside the substance of the lens.

The reason for measuring equivalent foci from these planes is that it introduces greater simplification into all the formulæ for magnifying powers and conjugate points. This will appear from what follows:

Introducing the values of F and F′ (Eqs. 25 and 26) into Eq. 21, we have

$$K_{2,4}\ K'_{2,4} = F\ F' = -F^2 = -F'^2 \ . \ . \ . \ . \ \text{Eq. 27.}$$

while Eq. 22 becomes

$$\frac{I''}{I} = \frac{-F}{K_{2,4}} = \frac{K'_{2,4}}{-F'} = \sqrt{\frac{-K'_{2,4}}{K_{2,4}}} \ . \ . \ \text{Eq. 28.}$$

Let us now measure all distances either from the first or second principal planes. We have

$$F = +\frac{F_2 F_4}{D} \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ \text{Eq. 25.}$$

$$F' = -\frac{F'_2 F'_4}{D} \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ \text{Eq. 26.}$$

$$U = K_{2,4} + F$$
$$U' = K'_{2,4} + F'$$

The two fundamental Eqs. 27 and 28, now become

$$\frac{F}{U} + \frac{F'}{U} = +1 \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ \text{Eq. 29}$$

and

$$\frac{I\,F}{U} + \frac{I'\,F'}{U} = 0 \ . \ . \ . \ . \ . \ . \ . \ . \ . \ \text{Eq. 30}$$

Or, since F = —F′

$$\frac{I'}{I} = \frac{U}{U}$$

These expressions are identical in form with the corresponding ones, (13) and (15,) for a single refracting surface. And herein lies the great beauty of this method, viz., that one can compute the magnification of a lens and the position of the ground glass from the simple expressions employed for a single surface. This, too, with no approximation for the centre of the field. That Eq. 29 is *not* true for all parts of the field will be evident when one considers the blurring of the image given by a single glass or a single achromatic near the edges of the ground glass when the centre is sharp. That Eq. 30 does not hold for all parts is shown in the *distortion* which one finds near the edges of the ground glass, even when the definition is sharp.

(*To be continued.*)

LIPPMANN'S COLOR (?) PROCESS.

THE following communication to the *London Times* appeared in the issue of that paper for Thursday, July 7th, 1892. It is probably the best and most unbiased account of the Lippmann process which has thus far appeared in the secular press. A careful perusal will show that the opinion given by the various photographic periodicals was a correct one, in which it was stated that the process as published was of no practical importance in solving the color process, and that the whole matter was merely a resurrection of a long-discarded German experiment.

The writer who is a well known English authority in the photographic world, needs no introduction to the American student in photography:

Sir:—The public has been so often deceived by the announcement of the discovery of "photography in natural colors" by a direct process, that it ought to be suspicious of such periodic announcements, and ask for some impartial testimony as to the correctness of the alleged discoverer's statements.

Professor Lippmann's name has been in every one's mouth; the papers—scientific and otherwise—have recently reported the complete success of his process of reproducing photographically the true colors of nature.

We have read that within the last two months Professor Lippmann submitted to the French Academy of Sciences color photographs, not only of the spectrum, but of various colored objects; and it is claimed that the color reproduction is perfect, all that is now required being to make the plates more sensitive, so as to shorten the time of exposure in the camera.

I had the opportunity a few days ago of carefully examining the above-mentioned color photographs in the photographic exhibition now open in the Champ de Mars, Paris.

People who were fortunate enaugh to see the really wonderful results obtained by another kind of color photography, recently exhibited before learned societies in London, will no doubt be interested in a careful description of Professor Lippmann's results as they appeared to me; and I would suggest that others interested in the subject should also examine and report upon them.

The exhibit comprises six photographs on glass plates, not seen by transparency, but by reflection, as were the old-fashioned daguerreotypes; three are of the spectrum, one of four pieces of colored glass (described as "a stained glass window"), one of a branch of holly, and one of a stuffed parrot.

None of the subjects photographed are shown for comparison, although the three latter might easily have been placed in the case with the photographs.

The photograph of the "stained glass" is about 1½ in. in diameter; the pieces of glass in it are described as yellow, green, blue, and red.

In the first place, there are no colors visible until the eye reaches a certain angle with respect to the surface of the plate, and by slightly changing the angle of vision the colors also change.

Seen by light reflected at a small angle, that part of the photograph which represents yellow glass is a peculiar spotty mixture of red and yellow; the green glass, a kind of yellow; the blue is blue and the red has a carmine hue.

Seen by light reflected at an angle of 45 deg., the yellow glass is seen as a dull green; the green as bright green; the blue as blue; the red as golden orange. In the photograph of a bunch of holly some of the leaves are a blue green, and others have a golden hue; the berries are orange, with the high lights on them represented as black spots. Not only does white photograph as black, but where there should be black it is absent altogether.

The photograph of the parrot shows it as perched on what appears from its shape to be a photographer's iron head-rest, the rods of which have come out blue in some parts, shading into red on others, with no true shadows, but with black high lights.

The parrot has a fuzzy appearance, and shows the same rendering of white as black, and the absence of true shadows. The colors on the parrot are the same as those on the iron head-rest, and where the tail of the parrot and the vertical column of the head-rest are parallel, the coloring is alike, both shading off from blue above to red below.

The best spectrum photograph exhibited is about 2½ in. long, and shows red, orange, yellow, green, blue, and violet in their proper order, but with nothing to indicate that the respective colours occupy the same position as the similarly colored rays in the spectrum which will produce them; the regularity in the order of the colors is no more than may be seen in color displays on the surface of stagnant pools The color is relatively dull in the orange red, and beyond the visible spectrum at both ends is an expanse of gray.

In one of the spectrum photographs the red is reproduced as a sort of magenta running into blue and green, at the end where the red light of the spectrum is the deepest and purest.

So far, therefore, as evidence is afforded by the examples I have described, it is apparent that the problem of direct photography in natural colours is not solved. I am, Sir, yours faithfully,

Bromley, Kent, Eng. CAMERON SWAN.

A GALLERY IN SAFFRON.

UNDER the National Act of May 5th, 1892, the collectors of Internal Revenue will soon proceed to make a nice collection of photographs of all the Chinese gentlemen that wash clothes, play fan-tan, or engage in other laborious pursuits within their districts. In this district a room in the Post-Office will be set aside for the camera, and the army of long-cued will forthwith stand up and " be took."

This interesting departure in the line of photography is made necessary by the Chinese Exclusion Act, full regulations for the enforcement of which have just issued from the office of Secretary Foster, of the Treasury Department.

According to this act every Chinese man, woman, or child that does labor within the United States must apply for registration in the district wherein he lives before May 5th, 1892. If caught hereafter without the necessary paper he may be made to sail the seas home again to the land of flowers and firecrackers.

The regulations prescribe that the Collectors of Internal Revenue shall receive applications at their own offices from such Chinese as are conveniently located thereto, and will cause their deputies to proceed to the towns or cities in their respective divisions where any considerable number of Chinese are residing, to receive applications. Due notice is required to be given Chinese through posters conspicuously displayed in the Chinese quarters of the various localities, or through leading Chinese, that will be sufficient to apprise all Chinese residing in their districts of their readiness to receive applications, and the time and place where they may be made.

Form No. 1 provides that the Chinaman shall give his age on

last birthday, present local residence, occupation, and state that he was lawfully within the limits of the United States on May 1st, 1892. He is required to sign his name to the application in English, if he can; if not, in Chinese characters, the Collector writing the English equivalent under the signature. Upon the application must be affixed an accurate unmounted photographic likeness of the applicant, which photograph will be securely attached to the application by adhesive paste. The Chinaman is also required to furnish two other photographs of himself, which are to be kept in the files of the Collector's office. If the Collector has any doubt as to the correctness of the photograph presented he may refuse to receive the application, and require a correct photograph. No tintype or any other sun picture will be received as a photograph.

Accompanying the application of the Chinaman is the affidavit of witnesses (Form No. 2). Two witnesses are required to this affidavit, and they must swear that they have known the Chinaman whose application for a certificate of residence is set forth, and that of their knowledge he was within the limits of the United States on May 5th, 1892, and that the photograph affixed is a correct likeness. If the applicant is unable to furnish such witnesses, the Collector may reject his application and refer the matter of issuing a certificate of residence to the Chinese applicant to the Commissioner of Internal Revenue for his decision.

Form No. 3, the certificate of residence issued to the Chinese laborer, sets forth that the Chinaman has complied with the requirements of Forms Nos. 1 and 2, and that he is "lawfully entitled to remain in the United States." This form is to be signed by the Collector of Internal Revenue of the district, and to have attached to it a correct photograph of the applicant to whom it is issued. On the stub to the form it is required to be stated: Name, age, local residence, occupation, height, color of eyes, complexion, and physical marks of peculiarity for identification.

After signing the certificate, and before issue, the Collector must affix his official seal thereto in such a manner that part of the seal impression must be made upon the photograph, and in addition thereto he is required to write across the photograph in red ink the number of the certificate and the name of the Chinese person.

A "CORNER" IN MEDALS.

BY WALTER D. WELFORD.

FOR what purpose do our present photographic societies exist? The probable replies to such a question would be most varied in character, but principally consisting of negatives. They are not for this or not for that. If, too, such a term is permissible, the negatives would be most positive ones. It is so easy to criticise and advise what not to do. No help, however, would be afforded by taking the " objects and aims " of societies as set forth in print upon the prospectus, or in the collection of rules and regulations. All that can be said about these is, that they start the prospectus or rules in a business-like way.

Glance through a bundle of them, and it will be found that they run upon the following general lines:

To further the art science of photography.

To encourage and promote the practice of photography amongst the members.

To promote the best interests of photography.

Even were they much more explicit it would not add to our knowledge as to why the society exists. They are merely preliminary flourishes, figurative expressions of sentiment. The point the practical man desires to arrive at is, whether the society is really attempting to carry out its avowed objects and aims. Certainly, this is to a large extent a matter of individual opinion, and yet I venture to assert that but few societies make much serious effort at anything beyond their own advantage. As, however, it is not my present intention to deal with the matter as a whole, but to tackle one of the negatives,—one of the things a society should not do,—the foregoing must be considered merely a preliminary flourish of my own to this article.

We have heard much in the past as to the " medal craze," and in the multiplication of awards, prizes, certificates, medals, etc., the ordinary every-day society plays a prominent part. As our American friends would put it, some of our society exhibitions and competitions, are " corners " in medals. Most of the awards are

foregone conclusions, or gifts for certain members. If, however, that only took place now and then, it would not matter so much, but where a profusion of awards are offered year after year, and are carried off by the same men each time, I consider the society a nice, quiet, comfortable corner, from which to extract annually a sweet little collection of medals and prizes.

Whether competitions are advantageous to societies or otherwise, I shall not deal with them, but when these competitions are held time after time, probably organized by the actual winners, with the result of merely increasing the award stock of three or four members, then I confidently assert that they are not for the benefit of the society generally, but for the aggrandisement of a few. Curiously enough, too, these few are generally officials to whom is due the continuance of the competitions. They organize and carry out the whole business, including the awards.

To illustrate the matter, I have carefully gone over the last three exhibitions of a large society, from which to deduce figures proving the case, but at the same time shall endeavor as far as possible to avoid giving any clue as to identity. It is, however, announced to have a membership of 200, and so is one of importance, as societies go. Commencing with the total number of exhibitors, the average for three years comes out at 39, which does not show any enormous enthusiasm upon the part of the general body of members. Now, taking the awards made, and not counting certificates or honorable mentions, the list is as follows: —

Officials		Ordinary Members.	
Mr. A. - -	8	1st year - -	4
Mr. B. - -	5	2d " - -	4
Mr. D. - -	5	3d " - -	6
Mr. G. - -	4		
Mr. C. - -	3		
Mr. E. - -	3		
Mr. S. - -	3		
Mr. M. - -	3		
Less than 3 -	6		
Total, - -	40	Total, - -	14

So that for the total three years the officials take forty prizes as against the ordinary members' fourteen. Or, to put it in a more detailed table:

	Officials.	Ordinary Members.
1st year	12	4
2d „	14	4
3d „	14	6

We therefore arrive at this, that in a society 200 strong 39 members only exhibit each year, and out of the medals awarded, 18 go to officials, and 4½ to ordinary members each time.

I trust none of my readers deem me hinting at any unfairness in the judging, for that is very far from my purpose. Moreover, it is not the point I wish to emphasize. What I say is, that as these officials regularly win the greater part of the awards, is it a tribute to their appreciation of the society's object "to advance the art science of photography?" Certainly not. It proves conclusively that in continuing their competitions, the officers are simply feathering their own nests. They practically organize their exhibitions with the full knowledge that they will gain certain prizes.

It is a tribute to their ability for advancing the cause of that prominent personage, "number one," no more, no less.

The question is, are such competitions beneficial to the society, or are they merely nice quiet "corners" in medals?—*The Photographic Review of Reviews.*

Hypnotism.—"Hybnodism," the German professor said thoughtfully, "vos a mendal disorder dot vos raging principally in der noosepapers. It vas hypertrophy auf der imachination, undt der writer on mendal phleenomens vos first attacked. You might call ut a sort auf writer's cramp auf der prain. Der ingrediences been made auf a fool undt a rascal. Mix thoroughly undt set avay in a cool blace.

"It's bedder you enchoy dis pecoollar phleenomens vhile she is goin', pycause she vill soon go down der stream auf time pehind der plue glass, der roller-skate, Koch's lymph, Keeley's gold cure undt pigheaded canes."—*Life.*

MACHINE-MADE EGGS.

YANKEE ENTERPRISE.

ARTIFICIAL eggs were invented some years ago by an ingenious Yankee, and were long merely a curiosity. At first they were too expensive for general consumption, but recent improvements in their manufacture have reduced their cost, so that they now come within the reach of the masses. A new egg factory in New Jersey, which started after the McKinley bill was passed, announces that it is now in full running operation, and will soon be ready to turn out 10,000 dozen artificial eggs a week. It will furnish the eggs, fresh from the factory, for 8 cents a dozen, with 5 per cent. off for cash. All eggs whose shells are broken will be taken back and mended.

This low price for first-class, fresh-laid, prime factory New Jersey eggs will enable the retail dealers in New York to sell them for 10c. a dozen during Easter. Yet some people think that the McKinley bill has made prices higher. See how it lowered the price of eggs! Before the McKinley bill was passed there was no egg factory in New Jersey, and now it contains one of the largest and finest egg factories in the world. A beautiful town is growing up around the egg factory! The factory eggs made in New Jersey are said to be superior to any eggs laid by the hens of pauper-labor countries, like England, Germany, France, China, and Japan. And anyone who eats them has the satisfaction of knowing that he is eating American eggs. The best of New Jersey experts say there is no difference between artificial eggs and hens' eggs. Oleomargarine is chemically the same as butter; American factory eggs are chemically the same as hens' eggs. Indeed, a dozen factory eggs were set under a hen in Hoboken, and a dozen of the most beautiful and chipper artificial chickens were hatched out. It is said, though it has not been verified, that under the wing of each was stamped "American chicken."

The secret of making artificial eggs is closely guarded in the New Jersey factory. All the ingredients are compounded by chemists in a laboratory. It is known that lime is used to make shells, while albumen, phosphate, and sulphur are employed in manufacturing the contents of the eggs. When the eggs come out of the work-room the egg-shells are rough. They are polished by machinery.

In eggs which are intended to be used for photographic purposes, in the production of albumen paper, the use of sulphur is carefully guarded against, and it is confidently claimed by the manufacturers that photo-

graphs upon paper coated with machine egg-albumen will be absolutely permanent.

A lady in Newark, to indulge in a little merriment, wore a string of the superfine egg-shells around her neck at a recent surprise party. Everybody thought they were East India pearls of marvellous size and trancendent value. They were grealy surprised when the lady told them that the ornaments they had so much admired were merely egg-shells so artistically made that they had the lustre of pearls.

The factory eggs may be fried or scrambled. They are excellent either boiled or in omelets. They are said to make better egg-nog than either Western or Southern eggs. A delicate flavor may be imparted to them by various extracts, so that the purchaser may have eggs flavored with vanilla, with lemon, strawberry or pineapple. They may be made every size, from that of a bantam egg to that of an ostrich egg. Many of the New Jersey poultry farmers are up in arms against the new industry. They declare that it will drive the old-fashioned New Jersey hens' eggs out of the market and ruin the chicken industry.

MAGNITUDE OF MOLECULES AND LIGHT WAVES.

WHEN we hear that the successive vibrations in a light ray of average wave length number about 600 million of millions in a second, the natural impression is that they must be submicroscopic in dimensions.

This, however, is from being the case. The actual length of the waves in such a ray is about $\frac{1}{50000}$ of an inch. The parallel rulings on glass plates known as Nobert's test plates, which are employed to test the defining powers of lenses, have been not only " resolved " but photographed when only $\frac{1}{150000}$ of an inch apart (*i. e.*, 150,000 to the inch). In other words, four such lines, spaced as in these rulings, could be drawn within the length of an average wave of light. This shows that the size of the ultimate particles or molecules of the glass must be very much smaller than the waves of light, since several furrows may be ploughed through them within the width of an average wave.

All these magnitudes are, however, far beyond our direct perception or powers of realizing, but we may at least get at some

sense of our shortcomings in power of conception from the following:

A maker of these "test plates," named Webb, many years ago made for the Army Medical Museum at Washington a specimen of microscopic writing on glass. This writing consists of the words of the Lord's Prayer, and occupies a rectangular space measuring $\frac{1}{294}$ by $\frac{1}{441}$ of an inch, or an area of $\frac{1}{129654}$ of a square inch.

The lines of this writing are about as broad as those on the test plates, which are $\frac{1}{50000}$ of an inch apart. They are, therefore, about as wide as average light waves. Now, then, to get some idea of the magnitude or minuteness of this writing.

There are in the Lord's Prayer 227 letters, and if, as here, this number occupies the 129654 of an inch, there would be room in an entire square inch for 29,431,458 such letters similarly spaced.

Now, the entire Bible, Old and New Testaments, contains but 3,566,480 letters, and there would, therefore, be room enough to write *the entire Bible eight times over on one square inch of glass*, in the same manner as the words of the Lord's Prayer have been written on this specimen.

Such a statement, without doubt, staggers the imagination, but the figures are easily verified and are certainly correct, and the whole statement at least serves to bring home to us the limited nature of our mental capacities as compared with the facts of the universe.

It also furnishes an interesting suggestion in a very different subject.

It has been often stated that a physical basis of memory may exist in permanent structural modifications of the brain matter constituting the surface of the furrows. In a highly developed brain this surface amounts to 340 square inches, and it would, therefore, appear that the entire memories of a lifetime might be written out in the English language on such a surface, in characters capably of mechanical execution, such as those of the Webb plate at Washington. See the *Lens*, December, 1873, p. 225 (Chicago). Also Trans. of Micro. Soc. (London), 1862, iii., vol. x., p. 69.—PRESIDENT MORTON, in the *Stevens Indicator*.

THE SWEET GIRL GRADUATE.

The leading photographers of the city were thrown into a whirl of pleasurable excitement by the invasion of the studios by the sweet girl graduates of the Normal School, who, after graduating in a blaze of glory at the Academy of Music, departed in large numbers to have their pictures taken. They were taken in large groups, medium sized groups, quarters, trios, pairs, and singly, and the camera sharps were almost worked to death in their efforts to do justice to the visions of loveliness which they were called upon to perpetuate upon prepared paper. A favorite pose with those taken alone was the "Look-aloft-or-keep-your-eye-on-the-bright-star-of-success" pose, so popular with the sweet girl graduates when making their addresses, although many preferred the queen-like pose combined with the steadfast outward gaze popularly known as the "Let-us-face-life's-trials-and duties-like-true-women-and-bravely-smile-in-the-mocking-face-of-adversity." This latter pose is a more difficult one to make a success of, photographically speaking, and the sweet girl graduate attempting it has to be a daisy to score a bull's-eye. After the exercises the lovely maidens came swarming out into the sunshine from the stage door, like so many white butterflies, and hastened away in carriages and afoot to keep their appointments with the photographers, and many who had not taken Old Grandpapa Time by his bang and arranged for their sittings in advance had either to wait a long time for their turn or to go from place to place until they found a photographer unemployed. And so one week hence or thereabout many a best young man will be made proud and happy with the counterfeit presentation of the maiden he adores.

Journalistic Amenities.—*The Pacific Coast Photographer* in the current number for June pays its respects in rather a vigorous manner to the editorial department of the *St. Louis Photographer.* "Our occidental brother certainly wields an aggressive quill. Personalities of this kind do not tend to elevate the standard of journalism, and are best avoided. However, as the case stands, it is now the *Fitzgibbon-Clark* innings, and it will behoove our California brother to '*Look Sharp.*'"

Prof. S. W. Burnham, the well-known astronomer, has resigned his position at Lick Observatory. He has achieved special fame as the discoverer of double stars. It is reported he will go East to accept the clerkship of the Federal Court in Chicago.

Photographic Scissors and Paste.

A Vulgar Outrage.—No one can read of the suit for an injunction to restrain the use of a little girl's photograph by a business house for advertising purposes, without wondering of what kind of material the responsible defendants in the case could be composed.

The suit was brought by the child's parents. One would think that ordinary decency would have prompted the firm making use of the picture, at once, to remove it from its advertising cards, and humbly to apologize for the offence it had committed. It is difficult to imagine a reputable business firm, taking without leave, the portrait of any private person, and spreading it abroad on the cards that advertise its wares. Still more difficult is it to imagine such a firm contending against an action to restrain it from violating the feelings of the father and mother of the child, whose portrait has been seized upon for indiscriminate distribution and vulgar show.

If business houses with such proclivities exist, there ought to be a law for the protection of modest private citizens against them. The man who insists on hanging up in groceries and barrooms, the highly colored counterpart of any photograph he may procure by borrowing, buying, or stealing, ought to be liable to a severe penalty.—*New York World.*

The ***Optician*** states that: Many eye troubles arise from the present style of books as printed for reading. The pages and columns are too wide, so that the eye cannot take in the whole of them in the range of one focus, but has to strain itself to pass from the beginning of each line to the end. The only way to avoid such a strain is to turn the head from side to side—a movement which is often seen to be practised by short-sighted people in reading wide columns. The width of a column or page of reading matter ought not to exceed, at most, two inches, as this is about the natural range of the eye when the head is kept motionless. With regard to the size, shape, and form of the type used, everyone knows, of course, that, as a general rule, the smaller the type the worse it is for the eyes; and therefore, it can be believed that the tiny edition of Dante produced at the French Exhibition, is said to have blinded two or three at least of the persons engaged in printing and correcting the sheets, but the shape of the type is of great importance to those who wish to preserve their sight. The

worst types of all are those which may be described as tall and thin (the French Elzevir founts). The round, fat-faced types are in every respect to be preferred, not only because the eye runs on more easily over them, but because there is besides less risk of confusing one line with another.

Flash-Light Power.—Captain I. K. Bingham, United States military attaché at Berlin, has recently brought to the attention of the Light-house Board an important discovery in flash lights, the invention of Professor Schevin, of Berlin. The apparatus is only two metres high by thirty-five centimetres in diameter. On the inside is a bellows through which benzine gas is passed, while air is forced through pumice stone strongly impregnated with benzine. This benzine gas is then passed through very finely powdered magnesium and saturated therewith; thence it passes out of an upright pipe through a small flame, by which it is lighted, and here it develops a luminosity of 400,000 candles. The activity of the apparatus is regulated by clockwork.

Economy is an important feature of the new invention, but its greatest advantage is its ability to penetrate an almost opaque atmosphere to a greater extent than any other light heretofore produced. With the use of ten centigrammes of the magnesium powder, it is shown by the official documents presented by Captain Bingham, that a flash of 400,000 candle power can be produced, and the flash can be seen on a clear, sunshiny day at a distance of six miles. The Light-house officials are so well impressed with the new light that they have already ordered an apparatus to be used in experiments at Staten Island. They have also brought the matter to the attention of the Chief Signal Officer, who will inquire into its merits for military signaling. The navy officials will also take it up.

Panoramic Lantern Slides.—At the Conservatoire des Arts et Metiers, Commandant Moessard lectured on panoramic photography, and showed his audience the effects of panoramic perspective on the screen. The latter was semi-cylindrical, eight metres wide and two-and-a-half metres high, the linen being stretched on a frame having the shape of a part of a cylinder of six metres radius. At a point corresponding with the centre of an imaginary circle, of which the screen formed a part, were placed four lanterns, each projecting a portion of a panorama. The most difficult part of the operation was to join the four views exactly, so as to make a continuous panorama; but this was overcome by each view showing at its edges a part of the next

view, to a width of two or three millimetres, the views being marked so as to make them coincide at the proper places, the illumination of the junctions being levelled up to that of the remainder of the picture, by screens in front and at the sides of the lime.—*Ex.*

Kodakers Want a Chance.—A petition has been freely circulated, both in this city and through the country, lately, which has been extensively signed. It is in favor of opening the ground of the Columbus Exposition at Chicago, to amateurs who wish to take photographic snaps at the buildings and exhibits. The Ways and Means Committee has already awarded the privilege to certain photographers, and the petition, besides protesting, sets forth that as ample a revenue will accrue if private fees are charged.

Life of the Commuter.—As many of our respected amateur photographers live "out on the road," the following bit of humor clipped from the *Pittsburg Dispatch* will not be out of place at the present time: The commuter is an enigma. He is just on the verge of happiness, always—not quite there. In the city a man may have a good night out. The commuter is to have his good time to-morrow. He looks forward to the day when something is booked to occur whereon to build his own happiness. "When they run that fast express—" "If they put on that new boat—" "Should the weather be fine next week—" "We'er to have another train on next month—" "Next year you won't know the place—" "We'll have a finer garden after awhile—" etc. The poor, trustful soul! And all this time his friends in the city are getting strawberries and everything else in the vegetable and fruit line months before the commuter has dropped canned goods. The inward satisfaction of knowing that you can get the best crabs, fish, beefsteak, or anything just around the corner that can be had in the world the commuter never enjoys. The possibilities of French or Italian table d'hote when you feel inclined for such society he dare not dream of. The suggestion of a clam cocktail is painful to him. At the idea of an hour or so in a German summer garden he at once buries his face in a time-table. Yet in another month you will see him around in all the bravery of his red shoes, woolen shirt and gaudy blazer, making believe very much that he is living an hilarious suburban life. Poor fellow!

In the Twilight Hour.

THE mere lapse of years is not life.

SOFT WORDS are hard arguments.

HAPPINESS cannot be bought by the bottle.

MAXIMS are the condensed good sense of nations.

NONE BUT a wise man can employ leisure well.

ONE HOUR'S sleep before midnight is worth two after.

HE THAT contemneth small things shall fall little by little.

AROUND me is darkness, but beyond there is light.—*Milton.*

THE GOAL of yesterday will be the starting point of tomorrow.

IT IS the men who want goods on credit that are overwhelmed in the end.

WHAT we know is little; what we do not know is immense.—*La Place.*

CONSCIENCE is a sleeping giant, but his starts are terrible when he awakes.

THE PROSPEROUS man who yields him up to temptation, bids farewell to welfare.

GREAT NAMES degrade instead of elevating those who know not how to sustain them.

SENTIMENTS of friendship which flow from the heart cannot be frozen by adversity.

MANNERS are of more importance than 'aws; upon them, in a great measure, the aws depend.—*Burke.*

THERE are but three classes of men the retrograde, the stationary, and the progressive.—*Lavater.*

KNOWLEDGE, truth, love, beauty, goodness, faith, alone can give vitality to the mechanism of our existence.

UNWISE WORDS, thoughtlessly spoken and then forgotten by a wife, often lead to the ruin of her husband and family.

HE is happy whose circumstances suit his temper; but he is more excellent who can suit his temper to any circumstance.

WHAT makes people so discontented with their own lot in life is the mistaken ideas they form of the happy lot of others.

TRUE HAPPINESS does not exist in any exhilaration, excitement, or ownership, but comes from the use of the faculties of body and mind.

THE EYES of other people are the eyes that ruin us. If all but myself were blind, I should neither want a fine house nor fine furniture.—*Franklin.*

I HAVE been as a child by the seashore, gathering here a shell, there a pebble; whilst the great ocean of truth lay unexplored before me.—*Newton.*

THE MAN who wants the best things, and is willing to pay just what they are worth, by honest effort and self-denial, will have no difficulty in getting what he wants at last.

THREE-FOURTHS of the difficulties and miseries of men come from the fact that most want wealth without earning it, fame without deserving it, popularity without temperance, respect without virtue, and happiness without holiness.

Literary and Business Notes.

PHOTOGRAPHY, by A. Brothers, F.R. A.S. London, Charles Griffin & Co., 1892; Philadelphia, J. B. Lippincott Co. A volume of 365 pages, large 8vo, with 24 full-page plates, and many wood-cuts in the text. This work is a complete manual of photography, giving its history, processes, apparatus, and materials, comprising working details of all the more important methods. This is the most complete and thorough work on photography which has thus far come to hand in the English language, and is only equalled by a few of the German works. The author in compiling this work has furnished a hand-book which should be in the hands of every student and professional who makes a study of the art-science. The chemistry and optics of photography are all discussed with sufficient fullness for all purposes. There is a word of advice we would give in connection with this book, viz.: If you are interested in photography, no matter whether as an amateur or professional, buy this book. It is to be had of all booksellers for a five-dollar bill, and you would not part with it for double the amount.

A TOO SHORT VACATION, by Lucy Langdon Williams and Emma V. McLaughlin. J. B. Lippincott Co., Philadelphia 1892. A neatly-gotten-up volume of over 200 pages, giving the adventures of two young women on a trip through Great Britain and the Continent, in which the kodak plays a principal part.

ROCHESTER, 1892. The Fourth Annual Report of the Rochester, N, Y., Chamber of Commerce. A well-gotten-up pamphlet of 172 pages, with an illuminated, embossed cover. The work gives a full account of Rochester's chief industries and local attractions. Rochester for years was known as the city of flowers. Of late, however, it is known as the city which "does the rest" after all the world has pressed the button.

WE acknowledge the receipt of a fine photograph, with the compliments of the Eastman Company. The group shows President Harrison and party during their visit tc Kodak Park on last Decoration Day.

FORTSCHRITTE IN DER PHOTOGRAPHIC. A reprint of Dr. J. M. Eder and E. Valenta's contribution to "Bechhold's Jahrbuch der Chemie." The value of the complete volume may be judged from this pamphlet, which in itself is a complete summary of all the late advancements in the whole photographic field, and a useful compendium for all who are conversant with the German language. Published by Richard Meyer, Frankfurt a. M.

PHOTOGRAPHIC WORK. Piper & Carter, No. 5 Furnival Street, Holborn, E. C. London. A photographic weekly. Price, 1*d*. Subscriptions received by Thomas H. McCollin & Co., 1030 Arch Street, Philadelphia. No exchange on our list comes more welcome than this new luminary upon the photographic horizon. Although the youngest venture in the field, it gives evidence of an experienced head upon mature shoulders at the editorial helm. Its advent seems like the return of a long-absent friend.

RECENT PATENTS.

The following list of patents relating to the photographic interest is specially reported by Franklin H. Hough, Solicitor of American and foreign patents, No. 925 F. St., Washington, D. C.

476,357.—Photograph holder, V. J. Augir, Springfield, Mo.

476,562.—Photographic camera, W. Scorer, Havant, England.

476,481.—Photographic prints—apparatus for trimming, H. H. Newcomb, Boston, Mass.

ISSUE OF JUNE 14th, 1892.

No issues

ISSUE OF JUNE 21st, 1892.

447,486.—Photographic Developer, M. Andresen, Berlin, Germany.

447,337.—Photographic Film Holder, T. Sault, New Haven, Conn.

447,243.—Photographic Holl Holder, F. A. Brownell, assignor to the Eastman Co., Rochester, N. Y.

ISSUE OF JUNE 28th, 1892.

477,728.—Photographic paper holder and cutter, T. E. Wood, Kalamazoo, Mich.

477,696.—Photographic plate holder, A. E. Page, Philadelphia, Pa.

478,323.—Photographic Plate Holder, C. H. Lohman, Chicago, Ill.

ISSUE of JULY 12th, 8921.

478,837.—Photographic Camera, H. A. Benedict, New York, N. Y.

478,780.—Photographic Camera, W. H. Bristol, Hoboken, N. J.

478,663.—Photographic printing frame, J. Urie Jr., Jersey City.

ISSUE of JULY 19th, 1892.

479,403.—Photographic Films, Manufacture of, H. M. Reichenback. assignor to Eastman Kodak Co., Rochester, N. Y.

479,186.—Photographic Plate holder, J. H. Hare, Brooklyn, N. Y.

ISSUE of JULY 26th, 1892.

479,587.—S. C. Fay and H. Willis, Rochester N. Y., Magazine Camera.